

Date: Tuesday, 4/25/2006 1:55:27 PM
User: Kim Johnston

Process Sheet

SPLIT

Customer	: CU-DAR001 Dart Helicopters Services	Drawing Name	: BLADE FITTING
Job Number	: 26838		
Estimate Number	: 12299		
P.O. Number	: N/A	Part Number	: D3488041
This Issue	: 4/25/2006 S.O. No. : N/A	Drawing Number	: D3488 REV B
Prsht Rev.	: NC	Project Number	: N/A
First Issue	: N/A	Drawing Revision	: B
Previous Run	: 26189	Material	: N/A
Written By	: SEE COMMENT BELOW	Due Date	: 5/20/2006
Checked & Approved By	: 06-04-25	Qty:	20 Um: Each
Comment	: Est Rev:A New Issue 06-02-28 JLM : Est Rev:B As per Rev B 06-03-30 JLM		

Additional Product

Job Number:



Seq. #: Machine Or Operation: Description :

1.0 D6103003 alum billet



Comment: Qty.: 1.0000 Each(s)/Unit Total: 20.0000 Each(s)

Alluminum Round Billet D6103-003

Batch: B2-806 27033

2.0 MORI SEIKI MORI SEIKI CNC LATHE LARGE



Comment: MORI SEIKI CNC LATHE LARGE

1-Turn as per Dwg DSK 101 & Folio FA625

2-Deburr

3.0 QC2 INSPECT PARTS AS THEY COME OFF MACHINE



Comment: INSPECT PARTS AS THEY COME OFF MACHINE

4.0 HAAS1 HAAS CNC VERTICAL MACHINING #1



Comment: HAAS CNC VERTICAL MACHINING #1

1-Machine as per Folio FA625 & Dwg D3488

2-Deburr

5.0 QC2 INSPECT PARTS AS THEY COME OFF MACHINE



Comment: INSPECT PARTS AS THEY COME OFF MACHINE

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes ☒ No ☐ DQA: ☒ Date: 06/06/12
 QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
06/05/30	4	Part is too short hdes is wrong the place the origin in the folio was not correct	<i>[Signature]</i>	verify position of origin and correct the folio scrap and replace	S.G 06/06/27	<i>[Signature]</i> 06-06-27	<i>[Signature]</i> 06-06-27	<i>[Signature]</i> 06-06-27
06/05/30	4	Dimension 1.317" is too thin its 1.290" tool pulled out of holder.	PH por QSI 042 06-06-12 see attached e-mail	changed tool holder and Remasured tool Part acceptable as <i>[Signature]</i>	PH por QSI 042 06-06-12 see attached e-mail	<i>[Signature]</i> 06-06-12	<i>[Signature]</i> 06-06-12	<i>[Signature]</i> 06-06-12

NOTE: Date & initial all entries

Date: Tuesday, 4/25/2006 1:55:27 PM
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Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: BLADE FITTING

Job Number: 26836

Part Number: D3488041

Job Number:



Seq. #:

Machine Or Operation:

Description :

6.0

QC8

SECOND CHECK



Comment: SECOND CHECK

EP 06/05/31

7.0

HAND FINISHING1

HAND FINISHING RESOURCE #1



Comment: HAND FINISHING RESOURCE #1

Chemical Conversion Coat as per QSI 005 4.1

HM 06/06/14

8.0

POWDER COATING

POWDER COATING



Comment: POWDER COATING

Powder Coat White Gloss (Ref: 4.3.5.1) as per QSI 005 4.3

DL 06/06/19

9.0

QC3

INSPECT POWDER COAT/CHEMICAL CONVERSION



Comment: INSPECT POWDER COAT/CHEMICAL CONVERSION

FL 06 06 20

10.0

ALS71032225

INSERT



Comment: Qty.: 4.0000 Each(s)/Unit Total: 80.0000 Each(s)

Pick:

Qty Part Number Description Batch

4 ALS7-1032-225 Insert M100489

DL 06/06/24

11.0

HAND FINISHING1

HAND FINISHING RESOURCE #1



Comment: HAND FINISHING RESOURCE #1

Install Inserts as per Dwg D3488

DL 06/06/24

12.0

QC5

INSPECT WORK TO CURRENT STEP



Comment: INSPECT WORK TO CURRENT STEP

06 06 26

13.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Identify and Stock

Location: FP 23

06-06-26

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Date: Tuesday, 4/25/2006 1:55:28 PM
User: Kim Johnston

Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: BLADE FITTING

Job Number: 26838

Part Number: D3488041

Job Number:



Seq. #:

Machine Or Operation:

Description :

14.0

DC

DOCUMENT CONTROL



Comment: DOCUMENT CONTROL

Inspection Level 21

RD 2/18/27

Job Completion



u 26.06.26

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

DART AEROSPACE LTD		Work Order:	26838
Description: Blade Fitting, LH		Part Number:	D3488-1
Inspection Dwg: D3488	Rev: B	Page 1 of 1	

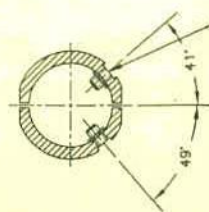
FIRST ARTICLE INSPECTION CHECKLIST

☒ First Article ☐ Prototype

Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
0.125	+/-0.010	0.130	✓			
2.620	+/-0.010	2.619	✓			
0.793	+/-0.010	0.793				cannot measure correctly / remove
1.351	+/-0.010	1.341	✓			
1.317	+/-0.010	1.316	✓			
90°	+/-0.1°	90°	✓			
1.802	+/-0.010	1.803	✓			
Ø0.508	+0.006/-0.001	0.508	✓			
R0.062	+/-0.010	R0.062	✓			
1.500	+/-0.010	1.502	✓			
8.000	+0.030/-0.000	8.007	✓			
11.18	+/-0.030	11.176	✓			
Ø0.484	+0.005/-0.001	0.484	✓			
1.180	+/-0.010	1.180	✓			
3.150	+/-0.010	3.150	✓			
3.070	+/-0.010	3.067	✓			
0.590	+/-0.010	0.588	✓			
0.125	+/-0.010	0.120	✓			
1.005	+/-0.010	1.005	✓			
3.500	+/-0.010	3.497	✓			
Ø0.297	+0.005/-0.000	0.297	✓			
Ø0.430	+/-0.010	0.425	✓			
0.100	+/-0.010	0.097	✓			

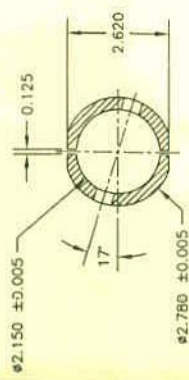
Measured by: J.G. 2	Audited by: Ep	Prototype Approval:	N/A
Date: 06/05/31	Date: 06/05/31	Date:	N/A

Rev	Date	Change	Revised by	Approved
A	06.03.31	New Issue	KJ/JLM	



SECTION B-B

0.297
C BORE 0.430 x 0.100
INSTALL ALS4-1032-225 (OR AKS4-1032-225
OR ALS7-1032-225 OR AKS7-1032-225)
INSERTS AFTER FINISH
(4 PLACES)

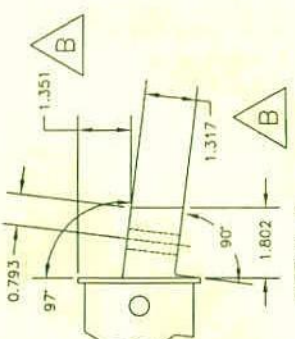
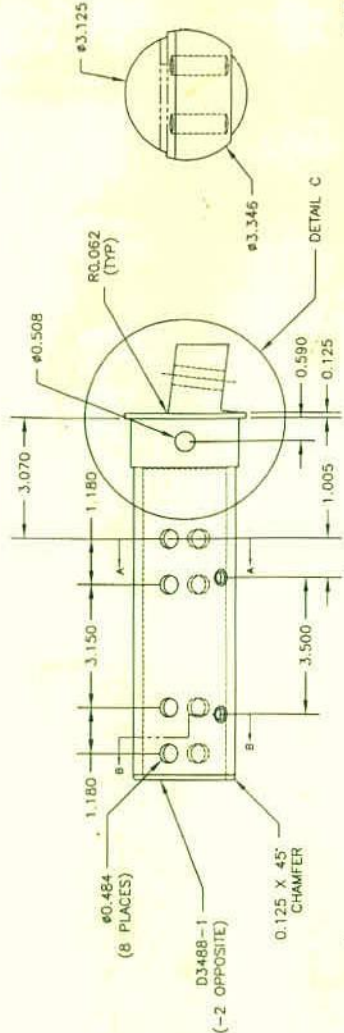
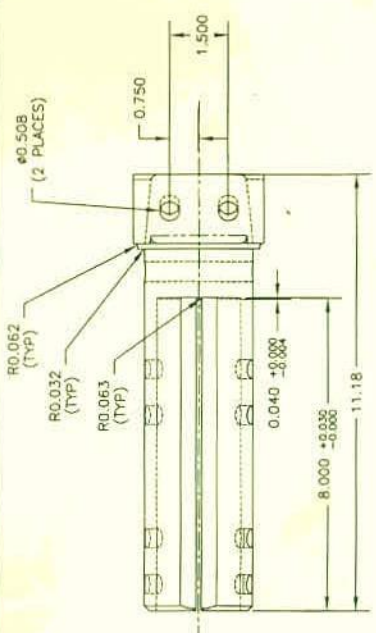


SECTION A-A

D3488-041/-042 BLADE FITTING ASSEMBLY PARTS LIST

QTY	QTY	PART NUMBER	DESCRIPTION
4	4	D3488-041	BLADE FITTING ASSEMBLY (LH)
1	1	D3488-042	BLADE FITTING ASSEMBLY (RH)
1	1	D3488-1	BLADE FITTING (LH)
1	1	D3488-2	BLADE FITTING (RH)
4	4	ALS4-1032-225 or AKS4-1032-225 or ALS7-1032-225 or AKS7-1032-225	INSERT

- D3488-041/-042 BLADE FITTING
- 1) MATERIAL: MAKE D3488-1/-2 FROM ALUMINUM 7075-T7351 ROUND BAR PER QQ-A-225/9 (REF. DART MATERIAL SPEC W7075T73R)
 - 2) FINISH: ACID ETCH, ALODINE PER DART OSI 005 4.1
 - 3) BREAK UNMARKED SHARP EDGES 0.010 TO 0.020
 - 4) INSTALL INSERTS AFTER POWDER COAT
 - 5) ALL DIMENSIONS ARE IN INCHES
 - 6) TOLERANCES ARE PER DART 001 018 UNLESS OTHERWISE NOTED



DETAIL C

RELEASED
REF. 05
EUN #787

D3488-041 SHOWN (D3488-042 OPPOSITE)

B	06.03.15	CHANGE THICKNESS
A	05.12.20	NEW ISSUE
DESIGN	PH	PH
CHECKED	PH	PH
DATE	06.03.15	DATE
TITLE	BLADE FITTING	TITLE
SCALE	1:3	SCALE

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DART AEROSPACE USA, INC.

DART AEROSPACE USA, INC.
DRAWING NO. D3488
SHEET 1 OF 1
REV. B

SHOP COPY
RETURN TO
ENGINEERING
CONTROLLED COPY
SUBJECT TO AMENDMENT
WITHOUT NOTICE
WORK ORDER
26838

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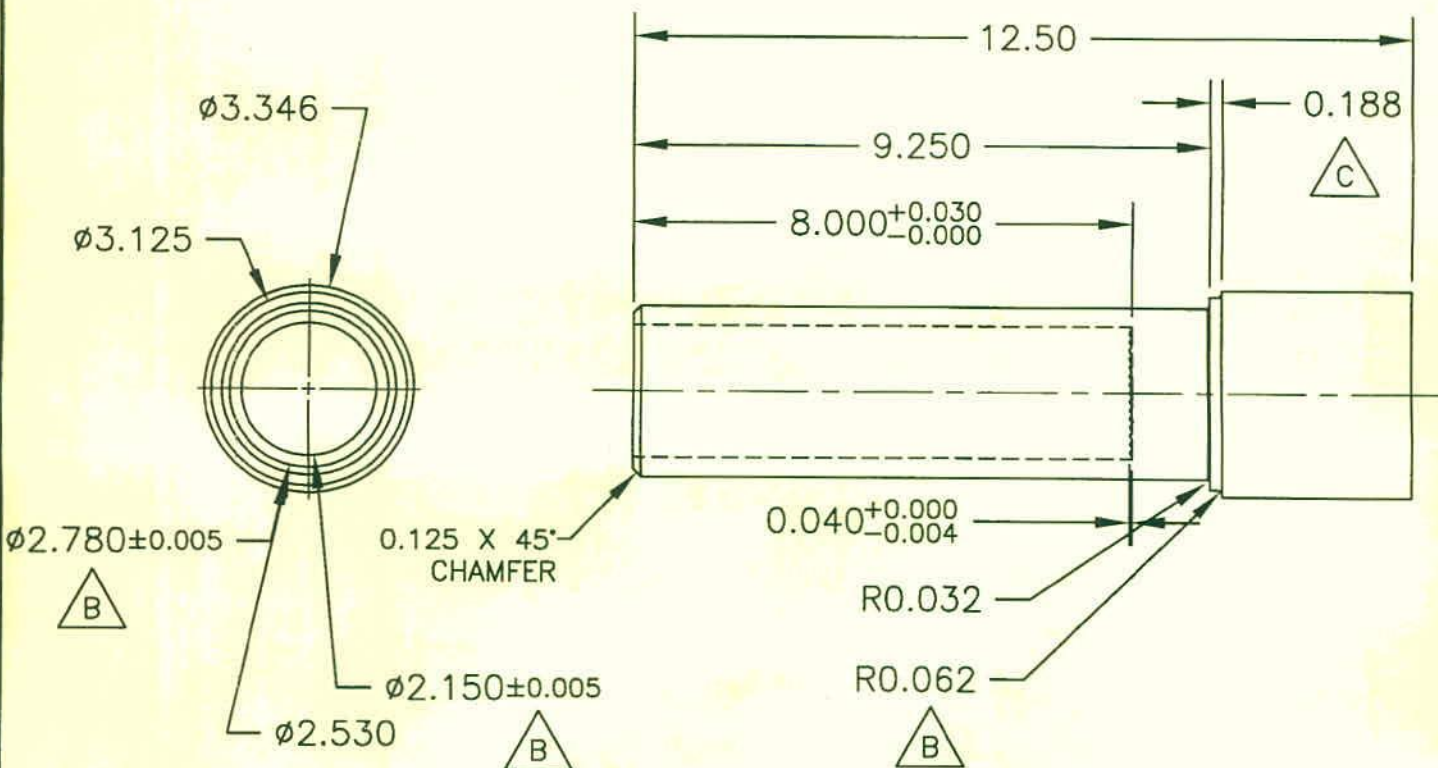
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DART06.04.17
M

DESIGN	DRAWN BY	DART AEROSPACE USA, INC.	REV. C
SK	SK	PORT HADLOCK, WA	
CHECKED	APPROVED	DRAWING NO.	SHEET 1 OF 1
SK	SK	DSK 101	
DATE		TITLE	SCALE
06.04.17		D3488-1/-2 TURNING DETAIL	1:3
A	05.12.21	NEW ISSUE	
B	06.03.02	ADD TOLERANCES AND RADIUS	
C	06.04.17	WIDEN TO 0.188 WAS 0.125	



DSK 101

- 1) MATERIAL: MAKE FROM ALUMINUM 7075-T7351 ROUND BAR PER QQ-A-225/9 (REF. DART MATERIAL SPEC M7075T73R)
- 2) FINISH: NONE
- 3) BREAK UNMARKED SHARP EDGES 0.010 TO 0.020
- 4) ALL DIMENSIONS ARE IN INCHES
- 5) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED

CERTIFICATE OF CONFORMITY

SOLD TO:

Dart Aerospace Ltd.
1270 Aberdeen Street
Hawkesbury, Ont.
K6A 1K7

SHIPPED TO:

same

<u>QUANTITY</u>	<u>PART NUMBER</u>	<u>PART NAME</u>	<u>P.O. NUMBER</u>
46	DSK101	Blade Fitting	1110

MATERIAL: supplied by DART

We hereby certify that the above parts were made in conformance with applicable drawings.

METEC Metal Technology Inc.

Shigi (Regula) Walz

Vankleek Hill, May 24, 2006



Peter Hum

From: David Shepherd [dshepherd@dartaero.com]
Sent: Monday, June 12, 2006 10:07 AM
To: 'Peter Hum'
Subject: RE: D3488-041 deviation in thickness

Based on your attached analysis, this deviation is acceptable.
Please attach a copy of this email and your analysis to the work order.

David

-----Original Message-----

From: Peter Hum [mailto:phum@dartaero.com]
Sent: Monday, June 12, 2006 7:02 AM
To: David Shepherd (E-mail)
Subject: D3488-041 deviation in thickness

Hi David,

Qty (1) D3488-041 thickness was machined too thin. The thickness is 1.275" and the nominal is 1.317. Therefore its 0.042" too thin

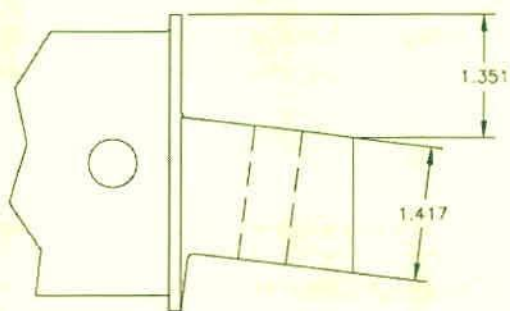
Using the approved SR-D350-636-3, I've analyzed the deviation thickness as attached.

As demonstrated, all margins are positives.

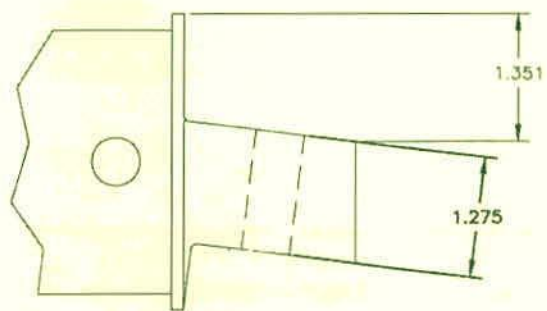
Is this deviation acceptable?

Peter Hum
Mechanical Designer

DART Aerospace Ltd.
Email...phum@dartaero.com
Phone...613-632-3336
Fax.....613-632-4443



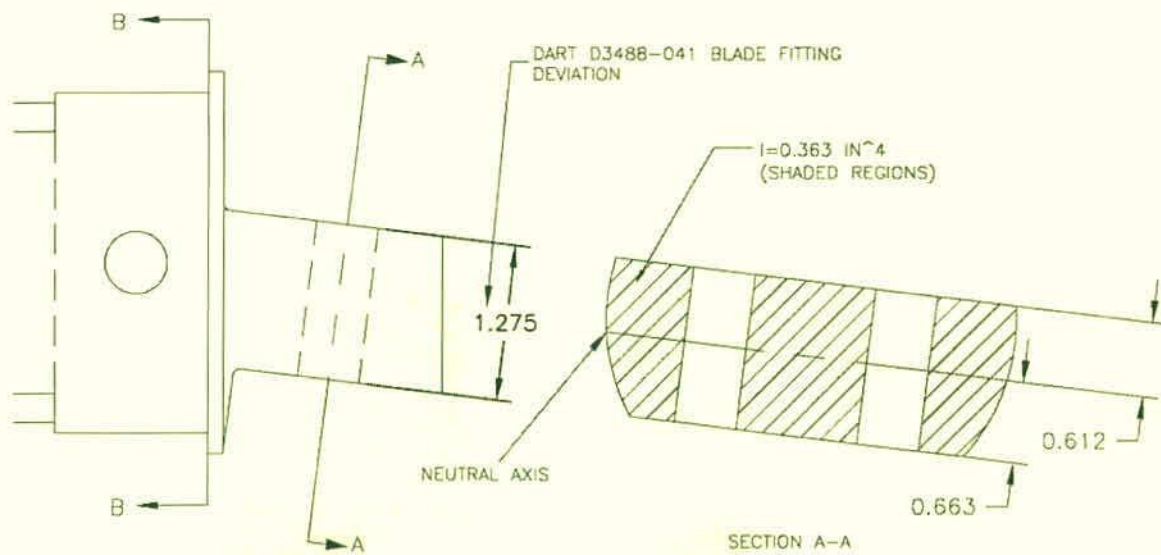
NOMINAL
DIMENSION



DEVIATION
DIMENSION

The following calculation shows that the Dart blade fitting @ the deviation can still withstand maximum bending moment.

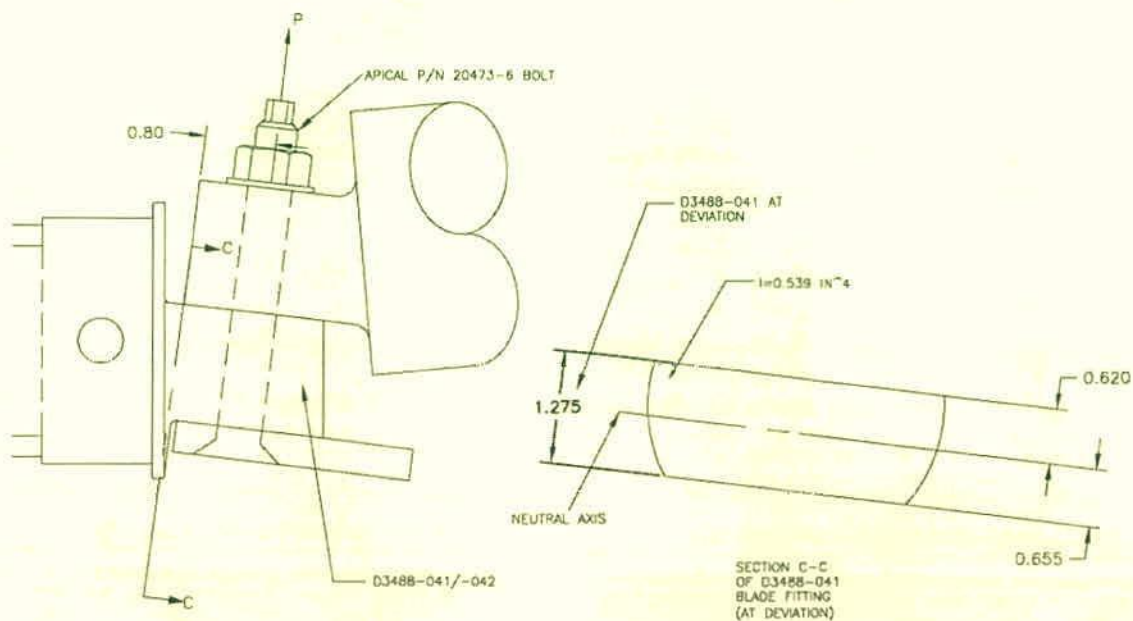
Component	Dart D3488-041 (APPROVED)	Dart D3488-041 (DEVIATION)
Material	7075-T7351 per QQ-A-225/9	
Ftu Ultimate Tensile Strength	68000 PSI	
(M) Moment at Section A-A	29083 lb-in (from Apical Report A1355-7)	
(I) Moment of Inertia of Section A-A	0.395 in ⁴ (from AutoCAD)	0.363
(C) Distance to outer fibers (higher number used, worst case)	0.688 in (from AutoCAD)	0.663
Stress (MC/I)	50656 PSI	53118 PSI
Margin of Safety (Ultimate) (Ftu/Stress)-1	0.34	0.28



NOTE: SECTION B-B IS UNCHANGED FROM ALREADY D3488-041

The analysis of the critical Section C-C of the Dart D3488-041 blade fitting shows that it is stronger than the already approved Apical bolt P/N 20473-6 which is used to transfer loads to the Dart blade fitting. Therefore by comparison the Dart blade fitting is acceptable.

Component	Dart D3488-041 (DEVIATION)	APICAL P/N 20473-6
Material	7075-T7351 per QQ-A-225/9	AISI 4340 (from Apical Report AI355-7, PG 3.6)
Ftu Ultimate Tensile Strength of bolt		166000 PSI (from Apical Report AI355-7, PG 3.6)
(A) Bolt Area		0.148 in ² (from Apical Report AI355-7, PG 3.6)
$P_{max}=F_{tu} \cdot (2A)$ Maximum Allowable Force on bolt		49136 lb
Ftu Ultimate Tensile Strength	68000 PSI	
(L) Moment arm length	0.80	
(I) Moment of Inertia of Section C-C	0.539 in ⁴ (from AutoCAD)	
(c) Distance to outer fibers (higher number used, worst case)	0.663 in (from AutoCAD)	
$M = F_{tu}(I/c)$ Maximum bending moment	55282 in-lb	
$P=M/L$ Bolt load required to fail section	69103 lb	
Margin of Safety (P/P _{max})-1	0.41	



The Dart D3488-041/-042 blade fittings replace the previously approved D2742 blade fitting that was approved per FAA STC SR00646SE. The following calculations show that the D3488-041/-042 blade fitting can withstand higher bending moments and is therefore acceptable by comparison.

Component	Dart D3488-041 (DEVIATION)	Dart D2742
Material	7075-T7351 per QQ-A-225/9	7075-T651 per QQ-A-200/11
Ftu	68000 PSI	77000 PSI
Ultimate Bending Moment		
(I) Moment of Inertia of section	0.363 in ⁴ (from D3488-041/-042 dwg)	0.158 in ⁴ (from D2742 dwg)
(c) Distance to outer fibers	0.663 in (from D3488-041/-042 dwg)	0.532 in (from D2742 dwg)
Ultimate bending strength	$Ftu = Mc/I$	$Ftu = Mc/I$
$M = Ftu(I/c)$	37230 PSI	22868 PSI
Maximum bending moment		
Margin of Safety (Md3488/Md2742)-1	0.63	N/A

